

WHAT IS CLAIMED IS:

1. A method of fabricating a conformal film on a substrate, comprising:

introducing a gas from a gas inlet into an expansion volume associated with an atomic layer deposition (ALD) system, the ALD system further including a reaction chamber; and

10 flowing the gas through a diffuser plate adjacent to the expansion volume and the reaction chamber, the diffuser plate including a protrusion located opposite the gas inlet, the protrusion operable to reduce turbulence in the expansion volume.

15 2. The method of Claim 1, further comprising the protrusion operable to reduce gas phase reactions in the expansion volume.

20 3. The method of Claim 1, further comprising the protrusion operable to facilitate an increased gas flow rate from the expansion volume to the reaction chamber.

25 4. The method of Claim 1, further comprising:
the diffuser plate including a plurality of openings through which the gas flows into the reaction chamber;
and
the protrusion operable to facilitate uniform gas flow through the openings.

30 5. The method of Claim 1, wherein the protrusion comprises a bevel.

6. The method of Claim 1, wherein the protrusion comprises a first surface and a second surface.

7. The method of Claim 6, further comprising the
5 first and second surfaces forming an angle of between
approximately thirty degrees and approximately sixty
degrees with respect to the diffuser plate.

8. The method of Claim 6, further comprising the
10 first and second surfaces including substantially similar
lengths.

9. The method of Claim 6, further comprising the
first and second surfaces including substantially similar
15 slopes.

10. The method of Claim 6, further comprising the
first and second surfaces including different lengths.

20 11. The method of Claim 6, further comprising the
first and second surfaces including different slopes.

12. The method of Claim 1, wherein the protrusion
comprises a sloped surface.

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13. The method of Claim 1, further comprising the
protrusion including a surface having a smoothly varying
slope.

14. The method of Claim 1, further comprising:
the expansion volume formed by a top wall, a bottom
wall and two side walls; and
a wall protrusion formed on at least one of the top,
5 bottom and side walls.

15. The method of Claim 1, further comprising the
gas including a flow rate between approximately 100 sccm
and 10,000 sccm.

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16. The method of Claim 1, wherein the gas
comprises an inert gas.

17. The method of Claim 1, further comprising
15 purging the reaction chamber with the gas flowing through
the diffuser plate.

18. An apparatus, for fabricating a conformal thin film on a substrate, comprising:
- a reaction chamber; and
- a gas injector adjacent to the reaction chamber, the
- 5 gas injector including:
- an expansion volume;
- a gas inlet operable to introduce a gas into the expansion volume;
- a diffuser plate located adjacent the expansion
- 10 volume and the reaction chamber; and
- a protrusion located adjacent to the diffuser plate and opposite the gas inlet, the protrusion operable to reduce turbulence in the expansion volume.
- 15 19. The apparatus of Claim 18, further comprising the protrusion operable to reduce gas phase reactions in the expansion volume.
- 20 20. The apparatus of Claim 18, further comprising the protrusion operable to facilitate an increased gas flow rate from the expansion volume to the reaction chamber.
- 25 21. The apparatus of Claim 18, further comprising:
- the diffuser plate including at least one row of openings on a first surface through which the gas flows into the reaction chamber; and
- the protrusion operable to facilitate uniform gas flow through the openings.

22. The apparatus of Claim 21, further comprising the openings interleaved such that a second surface of the diffuser plate includes one row of chamber openings.

5 23. The apparatus of Claim 18, wherein the protrusion comprises a bevel.

10 24. The apparatus of Claim 18, wherein the protrusion comprises a first surface and a second surface.

15 25. The apparatus of Claim 24, further comprising the first and second surfaces forming an angle of between approximately thirty degrees and approximately sixty degrees with respect to the diffuser plate.

20 26. The apparatus of Claim 24, further comprising the first and second surfaces including substantially similar lengths.

27. The apparatus of Claim 24, further comprising the first and second surfaces including substantially similar slopes.

25 28. The apparatus of Claim 24, further comprising the first and second surfaces including different lengths.

30 29.. The apparatus of Claim 24, further comprising the first and second surfaces including different slopes.

30. The apparatus of Claim 18, further comprising the protrusion including a surface having a smoothly varying slope.

5 31. The apparatus of Claim 18, further comprising the protrusion including a sloped surface.

10 32. The apparatus of Claim 18, further comprising: the expansion volume formed by a top wall, a bottom wall and two side walls; and a wall protrusion formed on at least one of the top, bottom and side walls.

15 33. The apparatus of Claim 18, wherein the gas comprises a flow rate between approximately 100 sccm and 10,000 sccm.

34. The apparatus of Claim 18, wherein the gas comprises an inert gas.

35. An apparatus for fabricating a conformal thin film on a substrate, comprising:

a reaction chamber; and

5 a gas injector adjacent to the reaction chamber, the gas injector including:

an expansion volume;

a gas inlet operable to introduce an inert gas into the expansion volume; and

10 volume and the reaction chamber, the diffuser plate including a bevel located opposite the gas inlet, the bevel operable to reduce turbulence and gas phase reactions in the expansion volume.

15 36. The apparatus of Claim 35, further comprising:

the diffuser plate including at least one row of openings through which the inert gas flows into the reaction chamber; and

20 the bevel operable to facilitate uniform gas flow through the openings.

37. The apparatus of Claim 36, further comprising the openings interleaved such that a second surface of the diffuser plate includes one row of chamber openings.

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38. The apparatus of Claim 35, wherein the bevel comprises a first surface and a second surface, the first and second surfaces including substantially similar lengths and substantially similar slopes.

39. The apparatus of Claim 35, wherein the bevel comprises a first surface and a second surface, the first and second surfaces including different lengths and different slopes.

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40. The apparatus of Claim 35, further comprising:
the expansion volume formed by a top wall, a bottom wall and two side walls; and
a wall protrusion formed on at least one of the top,
10 bottom and side walls.